VOLUME LXXXII NUMBER 1

MARCH, 1956

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OF THE

AMERICAN ENTOMOLOGICAL SOCIETY

PUBLISHED BY THE AMERICAN ENTOMOLOGICAL SOCIETY AT

THE ACADEMY OF NATURAL SCIENCES

PHILADELPHIA

THE AMERICAN ENTOMOLOGICAL SOCIETY

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Founded 1859 Incorporated 1862

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TRANSACTIONS

OF THE

AMERICAN ENTOMOLOGICAL SOCIETY

VOLUME LXXXII

FOUR NEW CHINESE SPECIES OF *XIPHIDIOPSIS* (TETTIGONIIDAE: MECONEMATINAE)

BY ERNEST R. TINKHAM

Indio, California

Four new species and the hitherto unknown male of a fifth species are described in this paper. The late Morgan Hebard loaned these specimens to the writer some years ago for study, but various circumstances have delayed until now the completion of this paper. The writer wishes to thank the authorities and Mr. James A. G. Rehn of the Academy of Natural Sciences of Philadelphia for the continued loan and their kind patience in this matter. Shortly before his death the late Morgan Hebard presented his great collection to the Academy of Natural Sciences of Philadelphia whose Orthopteran collection, where the types of these new species are located, is now one of the greatest collections in the world.

Family **TETTIGONIIDAE**

Subfamily MECONEMATINAE

Genus **XIPHIDIOPSIS** Redtenbacher

Xiphidiopsis Redtenbacher 1891, p. 531.—Hebard, 1922, p. 273.—Karny, 1923, p. 178; 1926, p. 130.—Chang, 1935, p. 42.—Tinkham, 1936, p. 410; 1943, p. 40; 1944, p. 505.

The genus *Xiphidiopsis* is the kind of a genus naturalists and taxonomists dream about but seldom see. Although many species are identical in form, size and coloration, the remarkable

development of the male genitalia into weird shapes makes for the ready separation of the many species. Not only do the cerci exhibit strange forms but the furculae or supra-anal processes of the posterior abdominal tergite are quite distinct. In one species, *X. suzukii* Matsumura and Shiraki they are greatly produced into a pair of long decurved arms with the tips of the bifurcate apex sharply pointed, the whole of which covers the large and uniquely shaped cerci. The subgenital plate is also strangely modified into a knife-like process bearing two pairs of apical uncinal hooks and these are obviously used to lock into the three pairs of prongs, two on the subgenital plate and one on the extreme base of the ventral pair of valvulae of the female. Females of other species are not so remarkably developed but all exhibit a great variety of shapes in the subgenital plate. This character, with that of the length and depth of the ovipositor and sometimes additional features on the eighth abdominal sternite, as well as color markings make for the ready identification of the females.

Until 1936, only one species was known from the great land mass of China, namely *X. clavatus* Uvarov (1933) described from the southern part of Kansu province. In 1936, the writer described *X. hastaticercus* from the high mountain, Loh Fau Shan, in central Kwangtung province of South China. Later that year he recorded the Formosan *X. suzukii* for the first time from China from Hupeh province. In 1939, Ebner described a third species *X. bituberculatus* from Chekiang. In 1943, the writer named five new species from the collections of the Heude Museum in Shanghai, and these were mainly from central and west-central China. The following year he described 12 new Chinese species, 9 from the United States National Museum collection, 3 from the Hebard collection. With one exception these twelve new species were indigenous to the West China province of Szechwan; the famous mountain, Mt. Omei, claiming seven of the eleven. With the description of four new species, two from Kwangtung and two from Mt. Omei, the total for China now stands at 25 species. An additional 10 new species still await description and these are from Kwangtung and Hainan Island and pertain to the Tinkham and Lingnan Natural History Survey and Museum collections.

Xiphidiopsis exhibits great endemicity in China, most mountain ranges possessing one to several indigenous species while the sacred mountain of western Szechwan, Mt. Omei, has, with the addition of two new species described in this paper, a total of nine now known from its 11,000 foot bulwark. Not a single Chinese species is known to occur south of China and, with the exception of *X. suzukii*, described from Formosa, all are of restricted distribution. *X. suzukii* is the only widely ranging one. It ranges from Hupeh to Kwangtung, and the writer has specimens from Hainan Island as well as from Hokkanzan, the high mountain just north of Seoul, Korea, where specimens were taken in October, 1945, while the writer was on military service in Korea.

Key to the Chinese Species of the Genus *Xiphidiopsis*

Males

1. Minute brachypterous species 2
   Small to larger-winged species 3
2. Uniformly green, tegmina 2.7 mms.; cerci hastate in lateral outline with an internal, basal, uncinate kook (Kwangtung)
   hastaticercus Tinkham
   Green with pleurites of thorax and abdomen black; head largely black, tegmina white and hidden by the pronotum (Szechwan)
   grahami Tinkham
3. Caudal femora green in life, usually pale brown in death but never banded; body color green 4
   Caudal femora heavily banded with black, coloration largely mottled brownish black; face shining black; furculae long, black and strongly divergent (Chekiang) ..... *pieli* Tinkham
4. Posterior dorsal margin of last abdominal tergite without furculae, if present imbedded, and apices not reaching the hind margin 5
   Posterior margin with paired furculae or processes projecting caudally of the hind margin 9
5. In lateral outline cerci entire 6
   In lateral outline cerci with lobes or points along margins 8
6. In lateral profile cerci short and stout with internal proximal enlargement, inner margin densely hairy (Szechwan)
   szechwanensis Tinkham
   In lateral profile cerci longer and slenderer without internal proximal enlargement, inner margin not densely hairy 7
7. Cerci long and straight with spathulate apex, internal surface of apical portion excavate and slightly incurved; tegmina spotted (Szechwan)
   spathulata Tinkham

Cerci long and slightly recurved in lateral profile and inbent apically (from above), the arms uniformly strong with an internal proximal boss; tegmina unspotted; furculae divergent but imbedded (Szechwan) ..... *appendiculata* Tinkham

8. In lateral profile cerci short and with a large median dorsal fin (Szechwan) ..... *gurneyi* Tinkham

In lateral profile cerci elongate, with dorsal and ventro-internal post-median fins; internal base with small spur (Chekiang) *capricercus* Tinkham

9. Supra-anal processes minute to small 10

Supra-anal processes enormously developed 16

10. Furculae flat and broad and fused at base; cerci very long, simple and acuminate (Kweichow) ..... *kweichowensis* Tinkham

Furculae slender; cerci not very long 11

11. From above, cerci strongly scythe-shaped with an inferior proximal spur projecting ventradly (Kwangtung) ..... *howardi* n. sp.

From above, cerci not scythe-shaped 12

12. In lateral profile apical portions of cerci with leaf-like flanges (Szechwan) ..... *phyllocerca* Tinkham

In lateral profile cerci without leaf-like flanges 13

13. Cerci with bifurcate apices 14

Cerci, from above, slender and forcipate with internal proximal portions enlarged 15

14. Cerci simple, straight, in lateral profile with bifurcations clavate; furculae mere points (Kansu) ..... *clavata* Uvarov

Cerci with outer margin straight in dorsal profile with bifurcations acuminate; inner edge drawn out into a flange with sinuous margin and with a very large proximal retrorse spur; furculae prominent, moderately spaced and slightly divergent (Kwangtung) .. *rehni* n. sp.

15. Internal margin of inner proximal areas with two pairs of opposing acute teeth as seen from above; furculae large, parallel and moderately separated (Kiangsi) ..... *kulingensis* Tinkham

Internal margin bearing large lobate spur with an additional spur just caudad and ventrad; furculae smaller, parallel and more widely separated (Szechwan) ..... *hebardi* n. sp.

16. Supra-anal process decurved with bifurcate apex; cerci broad at base with long, slender, inward-curving arms; subgenital process extending posteriorly as a thin blade with peculiar spinose apex (Eastern China, Korea) ..... *suzukii* Mats. & Shir.

Supra-anal process without apical bifurcation 17

17. Process straight and strongly deflexed in the middle; cerci cervoid in form, strongly inbent medianally with long bifurcate arms apically and a long interno-proximal, dorsally directed, prong with uncinate apex (Chekiang) ..... *cervicercus* Tinkham

Process broad and flat with only a deflexed tooth apically; cerci broad,

spathulate, apex incurved and bearing an inferior, dorsally directed tooth and a large, internal, proximal prong (Kwangtung)
megafurcula Tinkham

Females

1. Small brachypterous species 2
   Small to large fully winged species 5
2. Color uniformly green 3
   Color green with pleurites brownish; tegmina white and hidden under pronotum; size minute (body length 6.0, ovipositor 4.0 mms.) subgenital plate triangular (Szechwan) .....*grahami* Tinkham
3. Ovipositor heavy, 5.0 mms. long with greatest depth in middle 1.0 mm.; body heavy, subgenital plate circular (Sikang)
   yachowensis Tinkham
   Ovipositor light, 5.0 mms. long with greatest depth at base and 0.7 mms. in middle, body light 4
4. Tegmina 2.7 mms.; length to tip of ovipositor 15.0 mms. (Kwangtung) .....*hastaticercus* Tinkham
   Tegmina 1.0 mms.; length to tip of ovipositor 11.3 mms.; subgenital plate semicurcular, trikeeled and setate (Kiangsi)
   minutus Tinkham
5. Coloration green; tegmina extending well beyond apices of caudal femora; size large to medium-small 6
   Coloration mottled black, tegmina not extending well beyond apices of caudal femora (Chekiang) .....*pieli* Tinkham
6. Subgenital plate present 7
   Subgenital plate absent and replaced by 2 pairs of downward-projecting prongs plus a pair at base of ventral valvulae; tegmina with row of spots (E. China, Korea) .....*suzukii* Mats. & Shiraki
7. Apex of ventral valvulae without teeth 9
   Apex of ventral valvulae with 5 to 7 teeth 8
8. Head and pronotum dark brown; knees of caudal femora dark; size very large; ovipositor 11.5 mms. (Szechwan) ..*phyllocerca* Tinkham
   Head and pronotum uniformly green and unstriped; knees pale; size medium; ovipositor 10.0 mms. (Szechwan) ....*emarginata* Tinkham
9. Eighth abdominal sternite specialized 10
   Eighth abdominal sternite normal and similar to the preceding sternites 13
10. 8th abdominal sternite with sides parallel and apex with deep triangular notch, thus producing a bifurcate toothed apex (Szechwan)
    gurneyi Tinkham
    8th abdominal sternite not as above 11
11. 8th abdominal sternite raised into an arched, transversely restangulate bridge bearing lateral posterior knobs; the area under the plate excavate (Chekiang) .....*capricercus* Tinkham

8th not as above, trapezoid in form, the lateral margins convergent forward 12

12. Subgenital plate transversely elliptical in form with anterior and posterior margins shallowly concave (Szechwan) ..*transversa* Tinkham

Subgenital plate quadrate in form with the posterior margin convexly rounded (Szechwan) .....*szechwanensis* Tinkham

13. Subgenital plate large, circular in form with the apical area produced into two large appendiculate processes (Szechwan) *appendiculata* Tinkham

Subgenital plate not as above 14

14. Subgenital plate quadrate with the posterior margin squarely truncate and bearing a small median notch (Szechwan) ....*sinensis* Tinkham

Subgenital plate not as above 15

15. Subgenital plate very large for body size, oval in form with shallow lateral emarginations; cerci very large; body size very small (Szechwan) .....*omeiensis* n. sp.

Subgenital plate not as above 16

16. Subgenital plate of rectangular form 17

Subgenital plate of triangular or spathulate form 18

17. Subgenital plate large, rectangulate and flat, the margins upfolded to form large lateral convexities directed ventrodorsally. Size medium-large (Szechwan) .....*hebardi* n. sp.

Subgenital plate large, rectangulate, but with surface undulate, lateral convexities more basal and extending more caudo-dorsally. Size medium (Kiangsi) .....*kulingensis* Tinkham

18. Subgenital plate spathulate (Szechwan) .....*spathulata* Tinkham

Subgenital plate with apical two-thirds isoceles-triangular in form with squarely truncate apex bearing a small median notch. Size large (Kwangtung) .....*megafurcula* Tinkham

Xiphidiopsis hebardi new species (Pl. I, figs. 1, 2.)

A medium sized species most closely related to *X. kulingensis* Tinkham, 1943, from which it differs by slightly larger size, proportionately longer tegmina and wings, much smaller furculae and by the cerci themselves. Although the apical arms are forcipate in both species, the internal proximal plates of the cerci lie in a vertical plane in the new species, whereas they lie parallel with the arms of the cerci in *kulingensis*. Hence in profile the base of the cerci in *hebardi* appears deeper than in *kulingensis*. The females are closely similar but the larger size of *X. hebardi*, known only from Mt. Omei of Szechwan province of west-central China proper, will serve to separate the two species in the female sex.

Holotype: ♂, Mt. Omei, Baian-Kara-Ula Range, Szechwan, China, 4500 ft. elev., VII, 29, 1929. No collector's name is on the label but it is presumed these were all collected by the Rev. D. C. Graham, formerly on the staff of West China University at Chengtu for many years.

Type No. 5970 in the collection of the Academy of Natural Sciences of Philadelphia, ex Hebard Cln.

Measurements in millimeters: Body length to apex of cercus 14.0; to apex of tegmen 23.5; to tip of wings 25.0; tegmen 20.0 × 2.7; wings 21.5; caudal femur 10.4; caudal tibia 11.0; antennae incomplete.

Description.—Size medium and form typical of *Xiphidiopsis*. Depth of head twice its breadth; the face as broad as deep. Antennal foveolae separated in front by the breadth of the fastigium which is small with rounded apex and bears dorsally a median crease extending caudally from a point just caudad of the apex. Eyes medium large, subglobular, circular in outline and separated by a breadth one and one-half times the vertical diameter of the eye. Pronotum long and narrow; the metazona only a shade broader than the prozona, its posterior margin broadly elliptical in outline. Dorsum smooth and rounding evenly into the lateral lobes which are slightly broader than deep. Tegmina long and narrow and surpassing the apices of the caudal femora by almost 8 mms.; wings exceeding the caudal femora by almost 10 mms. Attingent to the posterior angle of the lateral lobes is a large subreniform opening with the prothoracic spiracle situated on its anterior margin. The function of this organ is unknown since the tympana are located proximally on the fore tibiae. Leg spination as follows: fore legs with the fore femora unarmed; fore tibiae with four long, external, semiappressed spines and a minute apical one and four larger and one small apical internal, ventral spines. Middle legs with the femora unarmed; mesotibiae with four large and one small apical, external, ventral spines and 4 large and two small apical spines on the internal ventral margin. Caudal femora unarmed; caudal tibiae with 22 to 24 external dorsal teeth and 21 to 23 internal dorsal teeth plus a larger apical spine on each row. External ventral spines 13 to 14 and the internal ventrals 3, and all placed near the apex. Genitalia: last abdominal tergite convex with the posterior margin concave medianally and bearing a pair of moderately spaced, parallel, medium sized furculae. Cerci short, in dorsal aspect with forcipate apical arms; internal proximal area, bulbous, with a pair of opposing nobs and a ventral pair of opposing teeth. Subgenital plate small, subcircular, with a pair of minute apical styli.

Paratypes: 16 males from the same locality as the holotype and ranging in date from August 2 to 22, 1929. There are also five males from the U. S. National Museum as follows: 2 ♂

Suifu, Szechwan; 1 ♂ near Muping, July 26, 1929, and 2 ♂, Shin Kai Si, Mt. Omei, Szechwan, 4400 feet, August 4-9, 1929. All USNM collected by D. C. Graham. Male paratypes closely similar to the holotype in every respect. Size range as follows: body length to tip cerci 12.0-13.0; to tip of tegmina 21.5-23.4; to tip of wings 23.2-25.6; pronotum 3.4-3.7; tegmen 18-8-20.0; wings 20.0-22.0; caudal tibiae 9-5-10.5; caudal tibae 10.0-10.5; cerci 1.2 mms. Paratypes (♂) similar to the holotype in every respect and deposited in the Academy of Natural Sciences of Philadelphia, United States National Museum and the Tinkham Collection.

Allotype: ♀, same data as the holotype but collected VIII, 19, 1929. Collection of the Academy of Natural Sciences of Philadelphia.

Measurements in millimeters: body length to tip of ovipositor 21.5; to tip of tegmina 24.5; to tip of wings 26.5; pronotum 3.6 × 1.7; tegmen 21.0 × 2.3, wings 22.5; caudal femora 11.5; caudal tibiae 11.5; ovipositor 10.5 × 0.7 mms.

Description.—Size, form and coloration similar to the holotype. Leg spination as follows: fore legs with fore femora unarmed; fore tibiae with 3-4 large plus one small apical external and internal ventral spines. Middle legs with mesofemora unarmed; mesotibiae with 4 large plus two small apical external and 3 large plus 2 small apical internal ventral spines. Hind legs with caudal femora unarmed; caudal tibiae with 32-33 plus 1 apical external and 28-30 plus 1 apical internal spines on the dorsal keels; ventral keels with 9 external and 4 internal apical spines.

Ovipositor almost straight, very slightly recurved in the apical half and acuminately pointed, with its narrowest depth just before the middle. Cerci upcurved in the apical two-thirds and covered with long sparse hairs. Subgenital plate with ventral surface flat, the rounded lateral margins concavely indented and its edges upfolded. The posterior margin of the plate is rather gently rounded with but a very slight central emargination.

Coloration: uniformly foliage green in life, somewhat paler or browner in the preserved specimens, with a narrow dark brown, post-ocular stripe just interad of the dorso-lateral margins of the pronotum.

Paratypes: 22 females with the same data as the allotype and ranging in date from July 29 to August 22, 1929. There are also 6 females from the United States National Museum as follows; 5 females from Shin Kai Shi, Mt. Omei Szechuan, China, elev. 4400 feet with dates of Aug., Aug. 4-6, Aug. 12, and

Aug. to Sept. 5, 1929. One female: Kiating, elev. 1300 feet, Aug. 12, 1929. Size range as follows: body length to tip of ovipositor 19.8-22.2; to tip of tegmina 22.0-25.5; to tip of wings 23.8-26.8; pronotum 3.4-3.7; tegmina 18.8-20.0; wings 20.0-22.5; caudal femora 9.8-10-5; caudal tibiae 10.0-10.5 and ovipositor 9.6-10.5 mms. Deposition as indicated for the male.

Paratypes identical to the allotype in every respect.

Shin Kai Shi is one of the temples on the chief spur nestling at the foot of the bulwark of Mt. Omei. In C. C. Liu's "Amphibia of Western China" figure 4, page 26, it is called "Hsin-kai-sze", the last syllable meaning temple. Liu indicates its elevation at a little over the 5500 foot level.

This interesting new species is named in honor of my much esteemed friend, the late Mr. Morgan Hebard, whose untimely death terminated his many valuable studies conducted on the Orthoptera of the Americas and of more distant regions of the world.

Xiphidiopsis rehni new species (Pl. I, figs. 3, 4.)

A medium sized species, not related in genitalia to any other known species and quickly recognized by the heavy, moderately short, cerci with bifurcate apices as seen from above and as observed from the side or below with an inner palmate plate extending proximally as a long, broad, uncinate spur.

Holotype: Male, Maan Chi Shan, Kwangtung, S. China, X to XII, 1921 (from C. W. Howard). The unique Type No. 5971, collection of the Academy of Natural Sciences of Philadelphia, ex Hebard Cln.

Measurement in millimeters: body length to tip of cercus 13.2; length to apex of tegmen 22.0; to apex of wings 23.5; pronotum 3.6 × 1.9; caudal femur 10.5; caudal tibiae 11.5.

Description.—Head in facial aspect about 1/3 deeper than broad; face slightly broader than deep. Eyes subglobular, almost circular in outline and separated by a breadth about 1 and 1/5 times the vertical diameter of an eye. Fastigial cone small with a median crease extending to the apex. Antennal foveolae separated by a space about equal to the dorsal breadth of the fastigium. Pronotum long and narrow with the posterior margin broadly elliptical. Dorsum of the pronotum rounding smoothly into the lateral lobes which are broader than deep; the ventral margin very broadly oval in outline.

Leg spination as follows: fore leg with the fore femur unarmed (right leg missing); fore tibiae with 6 external ventral spines of which the two apical are small, and with 5 longer internal ventral spines. Middle legs with femora unarmed; mesotibiae with 6 external and five internal ventral spines, the two apical pair small in each row. Hind legs with femora unarmed; caudal tibiae with 35-36 external and 30-35 internal dorsal teeth plus an apical tooth in each row and 10 external and 4 internal ventral spines which are uppermost in the folded leg.

Genitalia: 8th abdominal tergite strongly convex; the posterior margin slightly concave and bearing a pair of well-separated divergent prongs or furculae. Cerci from above straight, heavy, with bifurcate apex, the inner arm of which is inbent and uncinate. The internal proximal third of the cercus bears a long, flat, uncinate spur curving inwards and back, the inner edge of the cercus from the proximal spur caudally to the uncinate hook of the bifurcate apex extends inwards as a thin plate with sinuous inner margin. Subgenital plate broad at base narrowing abruptly to a gently decurved attenuate apex bearing two minute, deflexed, styli.

Coloration: uniformly foliage green in life, somewhat browner in death with a pair of brown, parallel stripes on the dorsum of the pronotum, each just within the lateral margins and with their posterior ends slightly incurved towards the rounded apex of the posterior margin of the pronotum.

This new species is named in honor of the veteran orthopterist James A. G. Rehn of the Academy of Natural Sciences of Philadelphia whose life has been so notably devoted to extending the frontiers of science in the realm of Orthopterology.

Xiphidiopsis howardi new species (Pl. I, figs. 5, 6.)

A medium sized species, similar in size and coloration to many other species, but in the character of the genitalia amply distinct from, and not closely related to, any of the known Chinese species. The scythe-shaped cercus with an internal, proximal, downward-directed prong quickly identifies this species which is known only from the unique male.

Holotype: Male, Maan Chi Shaan, Kwangtung, China, X to XII, 1921 (C. W. Howard). Maan Chi Shan is in the mountains of northern Kwangtung. Type No. 5972, Academy of Natural Sciences of Philadelphia, ex Hebard Collection.

Measurements in millimeters: body length to apex of cercus 14.0; length to apex of tegmen 22.0; length to apex of wings 24.0; pronotum 4.0 × 1.7; tegmen 18.5 × 2.2; wings 20.0; caudal femur 11.0; caudal tibia 11.5.

Description.—A medium-sized species of average build and greenish coloration. Depth of head greater than the breadth by one-third; face

slightly broader than deep. Eyes large, subglobular and almost circular in outline, separated by a breadth about 1 and 1/3rd the vertical diameter of an eye. Fastigium small and narrow, projecting only slightly forward and with a median dorsal crease not quite extending to the apex and which gives the impression that the fastigium was formed by lateral compression of two contiguous parts. Foveolae of the antennae separated by a space less than the dorsal breadth of the fastigium. Pronotum long and narrow, the metazona only a shade broader than the prozona; posterior margin broadly elliptical. Dorsum of the pronotum rounding smoothly into the lateral lobes which are about as broad as deep; their depth about that of the metazonal breadth. Tegmen long and narrow with rounded apex which surpasses the knees of the caudal femora by 6 mms. Apex of the wings exceeding the apices of the tegmina by 1.5 mms.

Leg spination as follows: fore legs with femora unarmed; fore tibiae with five external spines of which the apical is smallest and four longer internal spines of which the three basal are largest and of uniform size. Middle legs with femora unarmed; mesotibiae with six outer (apical two minute) and 5 inner ventral spines of which the apical 2 are minute. The outer spines are longest when the middle leg is mounted in a backward position, although in life when feeding on small leaf insects, the middle legs are undoubtedly held forward like the fore legs. Right hind leg missing; left caudal femur with lower keels unarmed. Caudal tibiae with 28 external, dorsal, piceous teeth plus a large apical tooth and 29 internal dorsal teeth plus a longer apical one. Ventral keels (in folded leg these are uppermost) with ten widely spaced, semiappressed external spines and four internal apical ones.

Genitalia: posterior margin of the distal abdominal tergite straight with a minute pair of widely spaced pointed furculae. Cerci heavily built, scythe-shaped in dorsal outline with strongly inbent falcate arms, their apices opposing, across a short space, the small proximal buttresses. The buttresses and falcate tip enclose an almost circular space. In lateral view the proximal portions of the cerci form a large lobular swelling bearing a long, heavy, interno-ventrally directed spur. Subgenital plate small, convex, semicircular in the basal portions with a thin caudally extended plate bearing two minute apical styli.

Coloration: uniformly foliage green in life; the preserved coloration retaining well the natural living colors. Dorsum of the pronotum laterally marked by a heavy dark brown stripe slightly convergent in the anterior third and also convergent posterioradly along the posterior margin of the pronotum. No other markings are present.

This species is named in honor of Dr. C. W. Howard who in 1921 was on the staff of Canton Christian College which later became Lingnan University. Maan Chi Shan is a high mountain (for South China) of 4000 to 5000 feet elevation situated

where the provinces of Kiangsi, Hunan and Kwangtung have a common meeting place. This location is directly north of the source of the North River and the Kwangtung side of the mountain lies in Jen-wha District. The types of *Xiphidiopsis megafurcula* Tinkham, 1944, now in the Academy of Natural Sciences of Philadelphia, were also collected by Dr. Howard in 1921 from Maan Chi Shan. The type of *X. howardi* Tinkham is unique.

Xiphidiopsis omeiensis new species (Pl. I, figs. 7, 8.)

A small winged species known only in the female sex, and quickly recognized from all other Chinese species by the following features: cerci of unusually large size; subgenital plate very large, roundly elliptical, with a slight emargination along each side; face broad and shallow, fastigium flat, thin, and from above narrowly triangular. Pronotum slightly broader in the prozona than in the metazona. Several of these features, such as the form of the fastigium and the shape of the pronotum are so distinctive that they may eventually warrant subgeneric recognition at a time when all the new species on hand have been described and a critical review can be made of the genus *Xiphidopsis*.

Holotype, ♀: Mt. Omei, Baian-Kara-Ula Range, Sze-chuan, China, 4500 feet elev., VIII, 6, 1929. Apparently collected by Dr. D. C. Graham, but no collector's name on the label. Type No. 5973 in the Collection of the Academy of Natural Sciences of Philadelphia, ex Hebard Collection.

Measurements in millimeters: body length to base of ovipositor 8.2; to tip of ovipositor 13.0; to apex of tegmen 16.3; to apex of wings 17.0; pronotum 3.0; caudal femora 7.2; caudal tibiae 7.5; ovipositor 4.8 × 0.6 mms.

Description.—Head in facial aspect as broad as deep; face one and two-thirds as broad as deep. Antennal foveolae in facial aspect, widely separated by a space equal to the broad fastigium. Eye large, subglobular, broadly oval in outline with the long axis parallel to the flat dorsum of the head. Eyes separated by a space approximately one and one-third times the depth of an eye. Occiput broad and flat; fastigium projecting forward as a thin flat plate with rounded apex and quite distinct in form from the other 23 described Chinese species. Pronotum flat, angularly rounded into the lateral lobes, the prozona broader and one fifth longer than the metazona which has the posterior margin circularly rounded. Lateral lobes of the pronotum almost twice as broad as deep; the posterior margin al-

most straight and the anterior and inferior margins forming a gently curving line. Outline of the organ at the posterior angle of the lateral lobes of the pronotum large and broadly oval; its function unknown. Tegmina moderately narrow, greatest depth about central, the posterior margin straight and the anterior border converging apically to the rounded tip. Tegmina and wings exceeding the apex of the short ovipositor by about 2.5 mms.

Leg spination as follows: fore legs with the fore femora unarmed; fore tibiae with three small outer, plus a very minute apical ventral spines and four longer inner spines plus a very minute apical spine. Middle legs with mesofemora unarmed; mesotibiae with five outer spines including a very minute apical one, and when the leg is in a forward position these spines closely correspond to the inner spines of the fore tibiae. Inner ventral spines of the middle leg four, including the very small apical one. Right hind leg (left missing) with the caudal femur unarmed; caudal tibia with 29 external dorsal teeth plus an apical one and 25 internal dorsal teeth plus an apical one. The ventral keels have 7 external and 1 internal teeth. Ovipositor short, moderately heavy and moderately recurved in the apical half, more so than in the females of the other new species described in this work.

Coloration: uniformly foliage green in life, paler and browner in the preserved specimen and without any markings of any kind. Eyes purplish and lateral margins of the pronotum buffy, but whether this buffy stripe is evident in life is not known.

Paratype: 1 female, Szechwan, Kwanhsien, VII, 16, 1930. This specimen like all other Szechwan specimens was collected by Dr. D. C. Graham and pertains to the Hebard Collection although the label bears only the above data. Measurements in millimeters: body length to base of ovipositor 10.3; to tip of ovipositor 15.0; to apex of tegmina and wings 17.4; pronotum 2.0; caudal femur 7.0; caudal tibia 7.8; ovipositor 4.5 x 0.6 mms. Paratype deposited in the Tinkham Collection. Female paratype identical to the holotype.

Xiphidiopsis appendiculata Tinkham

1944 *Xiphidiopsis appendiculata* Tinkham. Proc. U. S. N. M. 94 (3176): 523, fig. 157t (Type female described).

The identity of three concolorous male specimens representing the same species has been associated with the proper sex only after a careful examination. Up until the present, the males of six Chinese species have been unknown, namely;

X. appendiculata Tinkham, *X. bituberculata* Ebner, *X. emarginata* Tinkham, *X. sinensis* Tinkham, *X. transversa* Tinkham and *X. yachowensis* Tinkham. Some of these are easily dissociated. *Yachowensis* is a small brachypterous species, *X. bituberculatus* is known only from the eastern Chinese province of Chekiang and *X. sinensis* is a large species with the central area of the pronotum brownish. The remaining three species are closely similar in size with at most a light post-ocular stripe on the pronotum. Resorting to the chaetotaxy of the legs, the most valuable spine numbers are those on the fore and meso tibiae and the ventral spines of the caudal tibiae. The three male specimens have a tibial spination closest to that found in the females of *X. appendiculata* and the writer unhesitatingly places them in that species. Supporting this assignment is the fact that the only female paratype comes from Beh Luh Din, 30 miles north of Chengtu, Szechwan, China; the three males are from Kwanhsien, about 35 miles northwest of Chengtu.

In the shape of the male genitalia, the male of *appendiculata* shows closest relationship to *X. spathulata* Tinkham, both of which have rather simple forcipate cerci. From that species it is distinguished by the fact that in *spathulata* there is on the median internal surface of the cercus, when viewed from above, a slight bulbous area or very blunt tooth, whereas in *appendiculata* the cercal arms are thinnest medianally.

Allotype: Male, Kwanhsien, China, Sze-chuan, VIII, 9, 1928. Academy of Natural Sciences of Philadelphia ex Hebard Cln.

Measurements in millimeters: body length to tip genitalia 11.0 (deflexed); to tip tegmina 21.5; to tip wings 22.0; pronotum 3.5 × 1.9; tegmen 17.3; wings 18.5; cerci 2.0 mms.; antennae broken.

Description.—Size and coloration closely similar to the holotype female. Leg spination as follows: fore legs with fore femora unarmed; fore tibiae with 4 large internal and external ventral spines. Middle legs with meso-femora unarmed; mesotibiae with 4-5 long internal ventral spines including a small apical spine and 3 long and 2-3 small external ventral spines including the small apical one. Hind legs with caudal tibiae bearing 28-29 internal spines, plus apical spine and 26-29 external spines plus larger apical spine on the dorsal keels and 3 internal and 7 external spines distally on the ventral keels (uppermost in closed leg). Cerci, simple forcipate arms, slenderest medianally when viewed dorsally. Lest abdominal tergite with the furculae appearing as well imbedded, well separated and strongly divergent. Subgenital plate, squarely truncate with 2 small apical styli.

Paratypes: 2 males, same locality as the allotype but collected on July 17 and August 10 of 1930. One male paratype lacks one of the cercal arms; the other has the sternum somewhat broken and the hind legs glued on.

Paratypes closely similar to the allotype male in every respect. Range in millimeters as follows: body length to tip cerci 9.5-10.0; to tip tegmen 19.3-20.3; to tip wings 20.7-21.5; pronotum 3.7; tegmen 16.5-16.8; wings 18.0-18.3; caudal femora 9, caudal tibiae 9.7-10.0, cerci 2.0 mms. Paratypes deposited in the Academy of Natural Sciences and the Tinkham Collection.

Xiphidiopsis suzukii Matsumura and Shiraki

The collection contained one female from Maan Chi Shaan, Kwangtung, China, X-XII, 1921 (from C. W. Howard). This species is the widest ranging in eastern Asia, being known from Formosa and the high mountain, Hokkanzan, back of Seoul, Korea, south to the northern mountainous border of Kwangtung.

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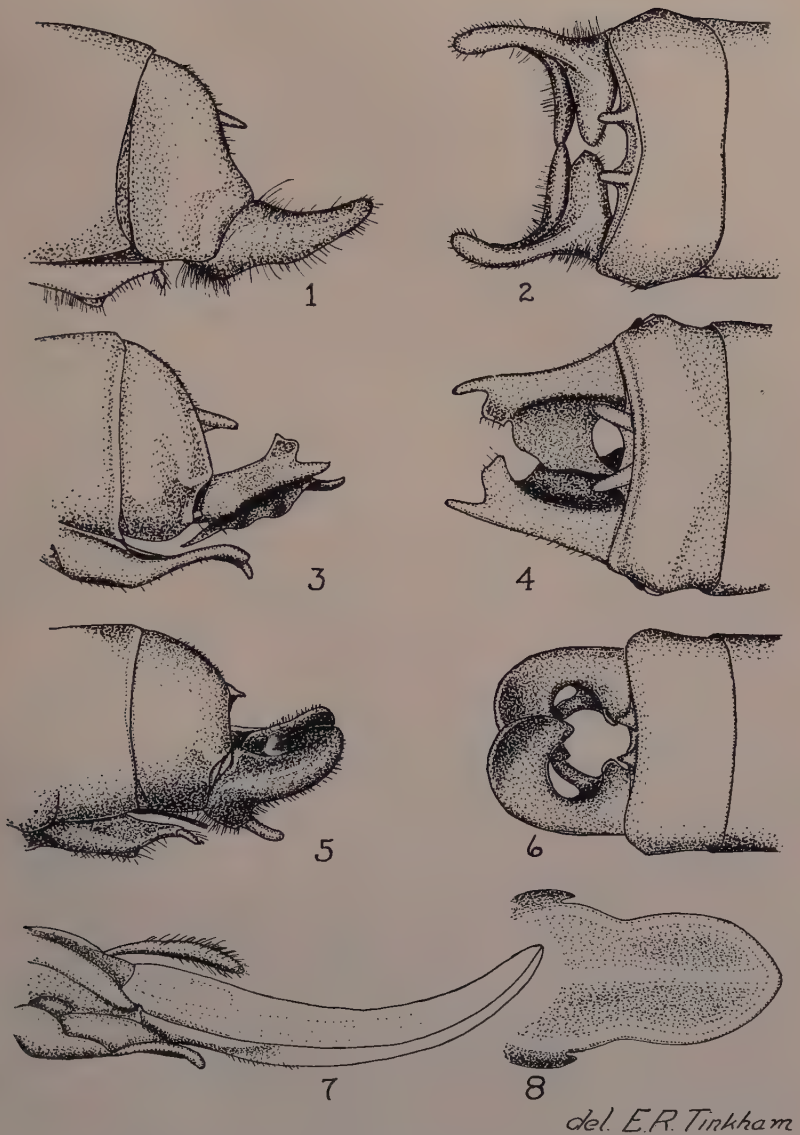
Explanation of Plate I

All figures greatly enlarged

1. Lateral view of genitalia of type male of *Xiphidiopsis hebardi* n. sp. from Mt. Omei, Baian-Kara-Ula Range, Szechwan, W. China.
2. Dorsal view of same.
3. Lateral view of genitalia of type male of *Xiphidiopsis rehni* n. sp. from Maan Chi Shaan, N. Kwangtung, S. China.
4. Dorsal view of same.
5. Lateral view of genitalia of type male of *Xiphidiopsis howardi* n. sp. from Maan Chi Shaan, N. Kwangtung, S. China.
6. Dorsal view of same.
7. Lateral view of genitalia of type female of *Xiphidiopsis omeiensis* n. sp. from Mt. Omei, elevation 4000 feet, Baian-Kara-Ula Range, Szechwan, W. China.
8. Ventral view of subgenital plate of type female of *Xiphidiopsis omeiensis* n. sp.



TINKHAM: NEW CHINESE XIPHIDIOPSIS

DIPTEROUS LARVAE PARASITIC ON ANIMALS AND MAN AND SOME DIPTEROUS LARVAE CAUSING MYIASIS IN MAN

BY CHARLES T. GREENE
College Park, Maryland

The material in this paper has been of considerable interest. Most of these larvae have never been treated this way before. Among those that have been described, there was no mention of the posterior spiracular plates. The posterior spiracles are the most constant character of the larva and very rarely show any variation. In all of my experience in my studies of the Dipterous larvae I have found only two cases of variation in the posterior spiracles. In each case one spiracle was perfectly formed and one was slightly deformed. In the anterior spiracles it is fairly common to find the slits variable on one side or the other on the same larva. In some larvae the posterior spiracles are located in a depression or a transverse pocket along the posterior edge of the last segment. This pocket may be closed or opened depending on whether the larva is in a liquid or the open air. When closed it is rather difficult to find if you are not familiar with it. The spiracles are controlled and may be opened or closed at will.

Some of these larvae were received by me from Mr. G. A. H. Bedford of Africa.

The material is in the collection of the U. S. National Museum.

OESTRIDAE

Cephenemyia sp.

Larva (Fig. 1). Pale luteous; the spines are luteous at their base, tip black. All the bare areas have the surface finely reticulated. Anterior spiracle small, rounded on the anterior edge with two rows of small, circular, raised areas. Posterior spiracles located in a depression. The

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See the special note under the family *Blepharoceridae* on how the adult emerges from the pupal shell.

plates are narrowly separated, brownish in color; each with a large, round, reddish-yellow button with a yellowish, crescent-shaped area around the outside of the button. Entire surface of the spiracular plate covered with small, round, black, raised areas like goose pimples. Eleven segments in addition to the head; second segment has four lobes on the anterior edge.

Length 29 mm., diam. 8 mm.

Host.—In the nose of a deer at Alsea, Oregon, April, 1945.

Gasterophilus sp.

Larva (Fig. 2). Very pale brownish yellow; strong spines along the segmental lines; these spines are pale luteous at the base and reddish black at the apex. Mouth hooks large, reddish-amber in color, black at apex; two small papillae above the mouth hooks. Posterior spiracular plate dark brown, somewhat elliptical with a round button in the center; at each end are three paler, narrow, sinuous slits. Eleven segments in addition to the head.

Length 19 to 22 mm., diam. 9 to 10 mm.

Host.—Label simply said Rhinoceros sp. from Juja Farms, Africa, May 15, 1909. #6737.

I learned there are two species of Rhinos. The black one *Diceros bicornis*; the white or square lipped one is *Ceratotherium simum.*

Gedoelstia bassleri Ged.

Larva (Fig. 3). Luteous with spines along the lower edge of the segments. Anterior spiracles small and slightly elliptical with several small spines arranged in two rows. Posterior spiracles well separated and located in a slight depression. Spiracular plates are nearly square with the four sides curved, resembling lobes; spiracular plates brownish with a rounded button located near the center of the plate. Below the spiracles are two, transverse, elliptical plates, each with numerous sharp spines; lower plate slightly larger, Lobe A. Eleven segments in addition to the head.

Length 23 mm., diam. 10 mm.

Larva in frontal sinus of host.

Host.—Connochaetes taurinus (Brindled gnu or Blue Wildebeast), Waterberg District, N. Transvaal, Sept. 1924 (G.A.H.B.)

Gedoelstia paradoxa Rod. & Beqt.

Larva (Fig. 4). This larva is very similar to *G. bassleri* Ged. The principal difference is the shape of the posterior spiracular plate and Lobe A. Posterior spiracular plate brownish, somewhat rectangular with the upper end broader, with a broad curve; posterior spiracle faintly lighter in color

and more circular in form. Lobe A is broader with numerous stout spines, some of which have a circular plate at their base. Eleven segments in addition to the head.

Larva luteous, 23 mm. long, 8 mm. diam.

Locality.—Clocolan, O[range].F[ree].S[tate]., Aug. 19, 1920. G.A.H.B.

Oedemagena tarandri (L.)

Larva (Fig. 5). Deep luteous tinged with gray. Segmental lines sinuous; front edge with numerous small spines, each with a circular plate at the base. Basal edge of segments with larger spines with a rounded plate at the base of each spine. Posterior spiracular plate with a large cleft in the center of the upper half; plate dark brown in color. Each spiracle is a sort of U shape and appears to be segmented; these segments are minutely reticulated; the button round; spiracular plate located in a shallow depression in the end of the last segment. Eleven segments in addition to the head.

Length 22 mm., 13 mm. diam.

Host.—Reindeer, collected April 16, 1935.

Larva is commonly called " warble " of the Reindeer.

Dermatoestris stepsicerontis Brauer

Larva (Fig. 6). Reddish luteous, appearing to have many small sections but there are only eleven segments in addition to the head. Posterior spiracles are narrowly separated; plates are black, microscopically roughened; somewhat oval in shape and broader at the base; button pale luteous. Central area of each plate deeply depressed; no special or visible slits; larval skin all around the posterior plates with very minute sharp spines.

Larva 18 mm. long, 12 mm. wide, nearly circular in form.

Host.—*Raphiceros campestris* (Thunberg) called So. African Steinbock.

Larva found in sub-cutaneous tissue.

Locality.—Kalkfield, S. W. Africa, May 14, 1924.

Cobboldia loxodontis Brauer

Larva (Fig. 7). Pale luteous with numerous sharp spines along the segmental lines; the spines on the lower part of the segments are larger. Anterior spiracle rather small. Posterior spiracles narrowly separated on upper half and widely separated on lower half; plates pale yellow with edges of the plate and the three slits blackish in color; spiracles located in a cavity which can be closed; last segment partly retractile. Eleven

segments in addition to the head, which is well deveoped and has numerous sharp spines; tip of head with two small papillae.

Larva 20 mm. long and 6 mm. diam. In stomach of the African elephant.

Host.—Loxodonta africanus L. Kenkelbosch, C. P., Sept. 9, 1919.

Neokiskia minuta Rodhain

Larva (Fig. 8). Brown testaceous, not many spines except some large ones on the ventral surface of the segments. Head small, retractile, with two small papillae; mouth hook large with an extra sharp point at the middle of the inner side. Posterior spiracles fairly large, well separated and located in a depression; the button small and round, located in the center of the plate. There are no definite slits visible. Spiracular plate yellowish red with the edges deep red; plate slightly rounded. Below the spiracles is a large elliptical plate with three rows of sharp, black spines; above these spines are five robust, black spines, each located on a circular plate; above this row are two more similar spines on plates.

Larva 22 mm. long, 7 mm. wide and 4 mm. high.

Larva in frontal sinus of host.

Host.—Connochaetes taurinus (Burchell) (Brindled gnu), Waterberg District, N. Transvaal, Sept. 1934. G.A.H.B.

Dermatobia hominis L. Jr.

Larva (Fig. 9). Very pale testaceous to pale brownish. Anterior half much broader, with transverse rows of black, sharp pointed spines, more numerous on the dorsum; segmentation indistinct, especially on the slender tail-like portion; segments 6 and 7 each has a row of heavy spines with a round plate at its base. Head small, retractile, with sharp, black, mouth hooks; around these are two rings of fine spines. Anterior spiracles are just an orange yellow opening, no definite plate. Posterior end rounded and covered with indistinct rows of numerous small, sharp, reddish spines; at the lower edge of this small, last segment are two, small, retractile, round lobes or tubercles, each with several small spines located in their center. Posterior spiracular plate white, elliptical, with an indistinct, rounded, depressed button in the center; on each side of this plate are three parallel slits of pale yellow with their edges darker.

Larva 13 to 23 mm. long; 10 to 11 mm. greatest diam.; 6 to 7 mm. greatest height; posterior half more cylindrical and slender.

Larval shape varies in the general appearance due to contraction and expansion.

Larvae from the backs of cattle from Nicaragua, C. A., Dec. 22, 1948. Also from various localities in South America.

Parasitic on man, dogs, cattle and other animals. The eggs are deposited under the skin.

Oestrus macropi Frogatt

(*Tracheomyia* Towns.)

Larva (Fig. 10). Elongate, oval, white, semi-transparent; convex on dorsal surface, perfectly flat on the ventral surface; with the ventral surface of 8 segments with transverse ridges of horny, narrow, serrated plates with fine spines. First segment small, encircling the head, the 8 following segments deeply impressed on the sides with divisions well marked; last segment bearing the posterior spiracular plates which are dark brown, separated by a narrow space; the button rounded, located near the center of the plate; this plate is slightly longer than wide, with the surface reticulated; spiracular plates located in a cavity which can be closed.

Larva 13 mm. long and 6 mm. diam.

In the mucus on the windpipes of the Kangaroo (*Macropus* sp.), from 1 to 6 larvae in each animal.

From Moramana Station, Walgett District, Australia, W. W. Froggatt and Theo. B. Broughton.

Cuterebra baeri Shannon & Greene

Larva (Fig. 11). Typical form of *Cuterebra*, black, very rugose, subshining. Nine visible segments besides the head segment which is generally retracted. The chitinous dermal appendages completely cover the surface of the larva. These appendages are broadly rounded, flattened and fitted in shingle-like fashion; these scale-like appendages have fine irregular teeth along the edge. Head segment and area around it luteous. From in front the head segment appears like two small, rounded lobes with the surface scale-like; each lobe has two microscopic tubercles, one above the other, on the anterior surface. Beneath each of these two cephalic lobes is a large, well-developed mouth hook. Posterior end depressed into shallow cavity around the edge of which the dermal appendages are not so broad but the teeth are more prominent. Spiracular plates are about twice as long as wide and separated by a fine lyrugose, raised area; surface of each plate with a faint, indefinite depression in the central area; the slits are of the serpentine type and are indistinctly broken; no button. Below each spiracular plate is a large rounded, raised surface having a scale-like appearance.

Length 22-27 mm., width 15 mm. Pupa very similar to larva.

Type locality.—Kartabo, British Guiana, July 22, 1924.

Larva from the Red Howler monkey *Alouatta sp.*

SARCOPHAGIDAE

Wohlfahrtia vigil Walker

Larva (Fig. 12). Pale yellowish white, very robust; posterior end slightly rounded, tapering to a point at the anterior end. There are 11 segments

in addition to the head. In the last segment is a cavity or pocket in which the posterior spiracles are located on the upper surface. Posterior spiracular plates are small, shining, deep reddish black, with three yellow slits.

No button present.

Larva 13 mm. long and 3.5 mm. diam.

Locality.—Dunkirk, Montana, Sept. 8, 1922. W. Roy Walker, collector.

Host.—Larva in back of an Airedale puppy 6 days old.

This species of larva has been found several times under the skin of young infants.

True Sarcophagid larvae never have a button on the posterior stigmatic plate. The females produce first stage larvae, rarely second stage larvae. They never lay eggs.

Larvae of this family, (*Sarocophaga* sp.) have been found in the nasal passages and ears of humans. A few species are parasitic on insects and turtles. They are usually scavengers.

LARVAEVORIDAE

Larvae of this family resemble those of Sarcophagidae but the posterior stigmatic plates always have a button. In some species the larvae are quite robust, as in *Belvosia* and *Dejeania*. They are usually parasitic on various insects. The larvae sometimes have large spines but usually only have ventral areas of fine spines used as ambulatory organs. Larvae usually have three slits in each posterior stigmatic plate but sometimes more. Always with a button. (See list under literature. Synopsis of the Puparia of 100 Muscoid Flies, Greene, 1922.)

Oedematocera dampfi Aldrich

Larvae (Fig. 13). Large, white, tapering slightly at cephalic end; eleven segments in addition to the very small head; segmental lines feebly marked on first four segments but more distinctly from segments five to eleven. Posterior spiracles elevated and well separated. Button round, depressed, in center of spiracular plate; numerous small ridges radiating from the button; upon each ridge is a serpentine slit in the form of small circular, yellow, openings.

Larvae 9 to 11 mm. long, 2.5 to 3 mm. diam.

Host.—Reared from the Tropical Migratory Locust *Schistocerca paranensis* Burm.

Reared at Córdoba, Mexico, by Dr. Alfons Dampf, Jan. 11, 1924. Two specimens from Prof. A. L. Herrera of Mexico City; and two were reared in Guatemala and sent in by Mr. J. G. Salas, Director General of Agriculture in that country.

MUSCIDAE

Musca domestica Linne

Larvae (Fig. 14). White, opaque, cylindrical, tapering toward the anterior end; eleven segments in addition to the head; last segment, in profile, rounded; segments 3 to 10 each with a group of fine black spines located at the posterior, ventral edge, used as ambulatory organs. Anterior spiracles small, fan shaped, with about seven or eight, small yellowish beads along the anterior edge. Posterior spiracular plates slightly raised and well separated; each plate is somewhat semi-circular in shape with the surface testaceous and a broad black edge surrounding the plate; button fairly large, nearly circular with a circle in the middle; three sinuous yellow slits.

Larva 10-12 mm. long and 2 mm. diam.

Usually breeds in excrement, but sometimes in decaying vegetable matter.

Common name—house fly.

Stomoxys calcitrans Linne

This larva is very similar in color and size to *Musca domestica* but the posterior spiracles are entirely different. (Fig. 15). The posterior spiracular plates are black, triangular in shape, well separated, and the corners are rounded; the circular button is located in the center of the plate; the slits are pale yellowish, well marked and somewhat resemble the letter S reversed; each slit located in a pale, whitish area.

Larva breeds mainly in horse manure. Common name—stable-fly.

Pollenia rudis Fabr.

Larva (Fig. 16). White, opaque, cylindrical, tapering towards the anterior end; last segment rounded; eleven segments in addition to the head. Anterior spiracle small, black to reddish, with five to seven small lobes of a deep luteous color. Posterior spiracles slightly raised; of a shining reddish black color; each plate with three elliptical raised areas, each with a narrow yellowish slit; button small, rounded, located on the inner edge of the plate.

Larva 11-12 mm. long and 2 mm. diam.

Parasite of the common earth worm. Also reared from cow dung.

ANTHOMYIDAE

Fannia scalaris (Fabr.)

Larva (Fig. 17). Pale testaceous; broad, slightly flattened, tapering towards the head; eleven segments in addition to the head, which is small and retractile into the under part of the first segment; first segment triangular, broader at its base, with two finger-like tubercles in front; segments 2-10 with a long, pointed, plumose tubercle on each side; last segment somewhat rounded with six long, plumose tubercles. The dorsum of segments 2-11 with a double row of small tubercles along the middle; each tubercle has three or four spiny bristles at its apex; segments 5-10 each has a smaller, similar tubercle at each posterior corner. Posterior spiracles located on the dorsum of the last segment, near its base; spiracular tubercle has a very pale area near the apex; this area has three circular pale areas with a darker border around the edges; button round, dark. Ventral surface of larva slightly paler.

Larva 5-7 mm. long and 5 mm. wide.

Larva is found in exrement and sometimes in decaying vegetable matter.

It also causes intestinal myiasis and sometimes causes irritation in the urinary tract.

Fannia canicularis (Linne)

Larva (Fig. 18). Pale testaceous; broad, slightly flattened, tapering toward the head; eleven segments in addition to the head, which is small and retractile into the under part of the first segment; first segment with two, long, slender tubercular projections at the anterior corners; segments 2-3 each with one long, slender, lateral tubercle on each side; segments 4-10 each has two, long, pointed tubercles on each side; last segment has six, long, pointed tubercles; all lateral tubercles on segments 3-11 have several, sharp, black spines at their base. Along the dorsal central area of segments 2-10 is a double row of long, pointed tubercles with fine spines at their base; segments 3-10 each has several small, black spines at each posterior corner. Posterior spiracles raised with three lobes at the apex, lobes darker along their edges; button round. Ventral surface slightly paler.

Larva 5-7 mm. long and 5 mm. wide.

Larva is usually found in decaying vegetable matter and excrement.

PANTOPHTHALMIDAE

Pantophthalmus tabaninus Thunberg

Larva (Fig. 19). Very large, robust, cylindrical, pale yellowish white to deep luteous. Eleven distinct segments in addition to the head. Head

very heavily chitinized, shining black, produced forward into a snout-like projection, not retractile; near the base of the head, along the side are five stout bristles in a row; on the side, below the center of this row is a pair of bristles close together; along the latero-dorsal surface of head are two large bristles on each side; mandibles short, very robust, pointed apically; under surface of mandible roughened; on the outer surface of each mandible are two large bristles; along the base of the head is a transverse ventral row of short bristles. The first thoracic segment is very large, heavily chitinized and for the most part a deep mahogany red; this deep red forms a broad, longitudinal central stripe continuing transversely along the apical edge of the segment, the ends reaching the basal segmental line; each side of this central stripe are three broad, tapering, red stripes, slightly sinuous, extending forward and nearly touching the apical transverse red stripe; between these three red stripes are three narrow yellow parallel stripes; from the center, the first and third have a brown bristle near the base; at the apical ends and between the red stripes, is a row of four, brown bristles; three brown bristles below the anterior spiracle; on the side near the base, is a prominent oval area with the broad end anterior, appearing like a dark ring, the center of which is depressed and forms the anterior spiracle; in this depression are two parallel white lines connected in the middle by a small white line; the surface around these lines is granular; second segment quite narrow, bare; third segment nearly twice as wide with a single bristle on each side on the ventro-lateral surface; the eight succeeding abdominal segments are of nearly equal width; segments 2-10 without chitin. Between segments 10-11, attached ventrally and folded up along the sdies, in a depression is a soft, delicate, smooth organ composed of several finger-like projections. This organ is apparently used for breathing when the larva is under the liquid of its burrow; also for ambulatory use. Last segment heavily chitinized, posterior surface oblique, faintly depressed in the middle; near base af segment is a transverse row of short, raised, parallel ridges; on posterior ventral edge, in the center, are two broad, flattened, pointed projections, below each is a large bristle; on each lateral edge are three brush-like groups of bristles, apparently sense-organs; transversely along the under edge of last segment is a deep depression which may be opened or closed; within this depression are located the posterior spiracular plates, circular, brownish black, heavily chitinized, with a crescent-shaped slit in the middle; around this central area is a circle of 40 nearly elliptical surfaces, pale yellow with a dark slit in the middle. On each side of this lower lip are three large bristles and above these are two other bristles. Anal opening concealed under the finger-like organ.

Larva 27 to 32 mm. long and 7 to 10 mm. diam.

Described from 19 specimens in the U. S. Mus. Coll. F. W. Urich, collector. All specimens alike in detail differing only in size.

Material was in alcohol; living specimens may vary in color.

This larva is wood boring in habit but, so far as known, when they enter the tree they use the entrance hole originally made by *Xyleborus* or *Platypus*. The fly larvae always burrow across the grain. Only diseased or recently felled trees are attacked. The borings are as clean as if made by a drill.

Material received from Mr. F. W. Urich of St. Clair Experiment Station, Trinidad, B. W. I.

DROSOPHILIDAE

Pseudiastata pseudococcivora Sabrosky

Pupa (Fig. 20). Pale luteous with a yellow-brown tinge; somewhat oval in shape; broader at the posterior end. Entire dorsal surface finely reticulated. Ventral surface flattened; the entire edge with a definite, short, luteous fringe. Posterior spiracular plate indented on the anterior edge; with two round, cone-shaped projections pointing outward, each resembling an acorn in its cup. Each cone has a raised ring at the base. Upon each cone are 3 spiracular, yellow slits located on the outer surface; a rounded, dark button located at the inner edge.

Pupa 4 to 5 mm. long; 2.25 to 3 mm. wide; 1.25 to 2 mm. high.

Locality.—Panama and Canal Zone, June 1921; Mexico, Jan. 24, 1942.

STRATIOMYIDAE

Hermetia illucens (L.)

Larva (Fig. 21). Deep gray to nearly black; sometimes with small areas with a deep reddish tinge; larva heavily chitinized, sides parallel; entire body very finely reticulated. Eleven segments in addition to the head; head not retractile, with 10 bristles on the dorsum and two below; first segment with 10 bristles on dorsum, second segment with 6 dorsal bristles; segments 4 to 10 each with 3 bristles near the outer edge and 6 bristles along the posterior edge; last segment with fringe and 8 dorsal bristles. Posterior spiracles located in a transverse pocket along the posterior edge; pocket may be opened or closed. Each spiracular plate oval shaped, pale yellowish color with a broad, dark, oval ring; central area depressed with a slit opening in the middle.

Larva 21-23 mm. long and 5-6 mm. wide.

Larva feeds mostly on decaying vegetable matter but has been found several times on carrion. Larva sometimes causes myiasis in man. Larvae are common through the tropics and warm

climates and localities. I captured a live adult in Philadelphia many years ago.

BLEPHAROCERIDAE

Note.—One afternoon in the late spring, the late H. S. Barber and I went collecting along the banks of the Potomac River just below Cabin John, Maryland. It was at the mouth of a small stream flowing into the Potomac. I found some small brown pupae floating on the surface of the water. While collecting some of these I noticed some small, pale object shot up into the air from 3 or 4 of these floating pupae. The object went up about 24 to 30 inches from the surface of the water. Suddenly the wings spread and the fly fluttered to the leaves of some near-by foliage. In about a half hour or so the wings were dried so that the adult could fly. I saw several specimens perform in this manner.

The larvae of this family cling to rocks beneath the surface of the water. They are attached to the rock by means of six circular ventral, sucker discs. When it is near time for the adult to emerge, the pupa detaches itself from the rock and floats on the surface of the water for a short time. I think this is the first record known of how the adult emerges from the pupal case.

Blepharocera sp. (Identified by C. T. G.)

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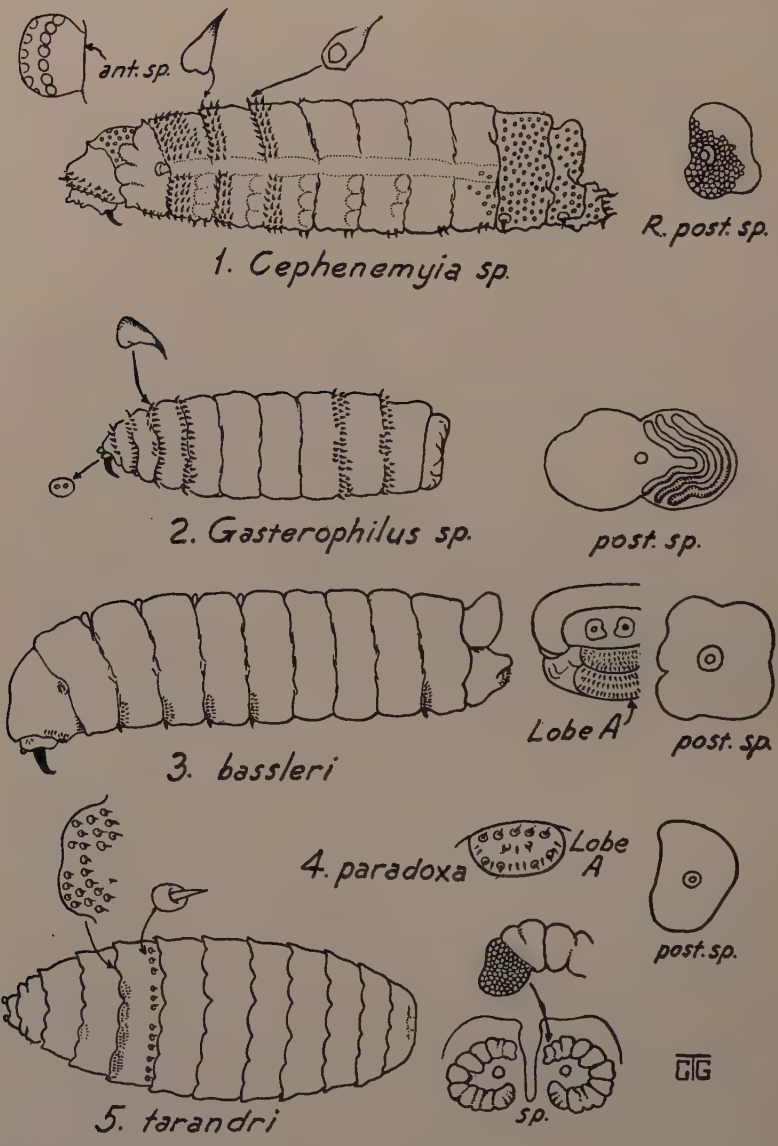
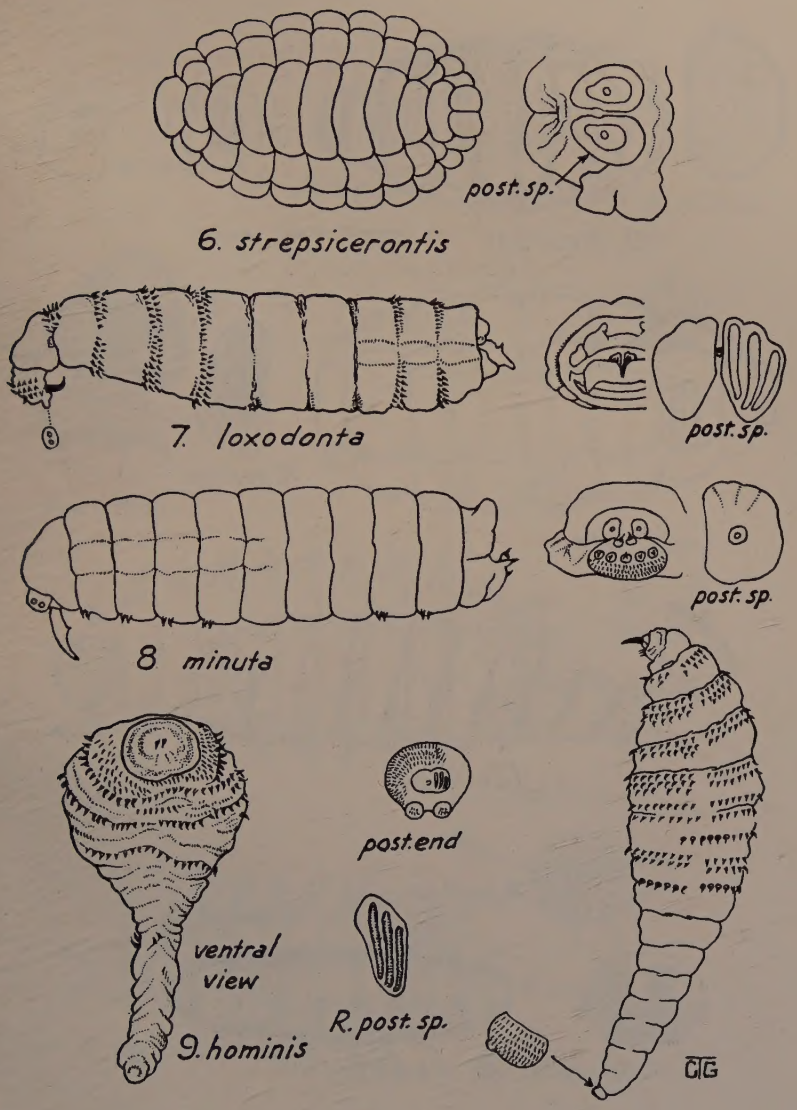
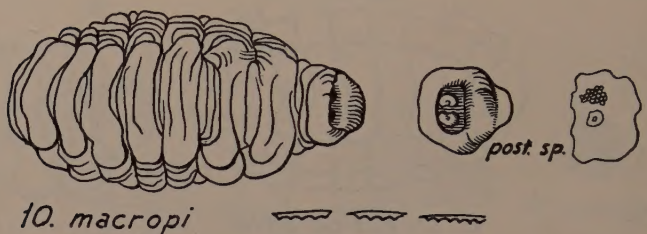
Explanation of Figures

(All Drawings by C. T. Greene)

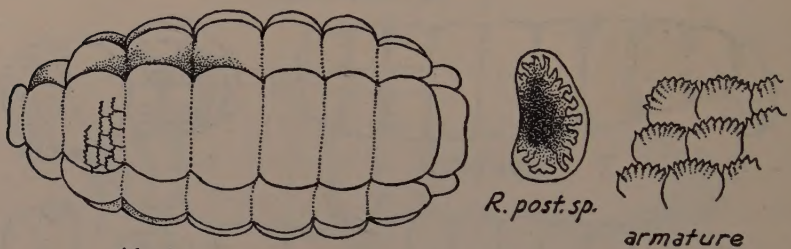
Fig. 1.—*Cephenemyia* sp. Larva, anterior and posterior spiracles
Fig. 2.—*Gasterophilus sp.* Larva, posterior spiracles
Fig. 3.—*Gedoelstia bassleri* Ged. Larva, Lobe A and posterior spiracles
Fig. 4.—*Gedoelstia paradoxa* Rod. & Beqt. Lobe A and posterior spiracles
Fig. 5.—*Oedemagena tarandri* (L.) Larva and posterior spiracles
Fig. 6.—*Dermatoestris strepsicerontis* Brauer Larva & posterior spiracles
Fig. 7.—*Cobboldia loxodonta* Brauer. Larva & posterior spiracles
Fig. 8.—*Neokiskia minuta* Rod. Larva & posterior spiracles
Fig. 9.—*Dermatobia hominis* (L. Jr.) Larva & posterior spiracles
Fig. 10.—*Oestrus macropi* Froggatt. Larva & posterior spiracles
Fig. 11.—*Cuterebra baeri* Shannon & Greene. Larva & posterior spiracles
Fig. 12.—*Wohlfahrtia vigil* Walker. Larva & posterior spiracles
Fig. 13.—*Oedematocera dampfi* Aldrich. Larva & posterior spiracles
Fig. 14.—*Musca domestica* Linne. Larva & posterior spiracles
Fig. 15.—*Stomoxys calcitrans* Linne. —— posterior spiracles
Fig. 16.—*Pollenia rudis* Fabr. Larva & posterior spiracles
Fig. 17.—*Fannia scalaris* (Fabr.) Larva & posterior spiracles
Fig. 18.—*Fannia canicularis* (Linne). Larva & posterior spiracles
Fig. 19.—*Pantophthalmus tabaninus* Thunberg. Larva anterior & posterior spiracles
Fig. 20.—*Pseudiastata pseudococcivora* Sabrosky Pupa & posterior spiracles
Fig. 21.—*Hermetia illucens* (L.) Larva & posterior spiracles


ant. sp.
R. post. sp.
1. Cephenemyia sp.
2. Gasterophilus sp.
post. sp.
3. bassleri
Lobe A
post. sp.
4. paradoxa
Lobe A
post. sp.
5. tarandri
sp.


post. sp.
6. strepsicerontis
7. loxodonta
post. sp.
8 minuta
post. sp.
post. end
ventral view
R. post. sp.
9. hominis
CG



10. macropi

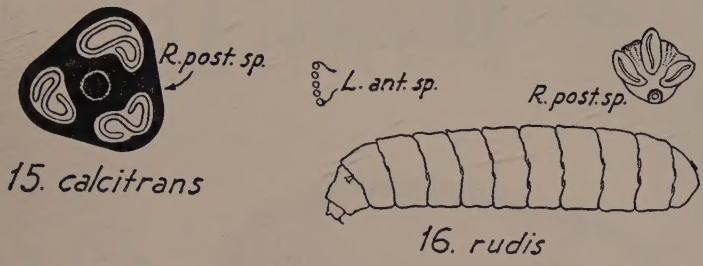


11. baeri

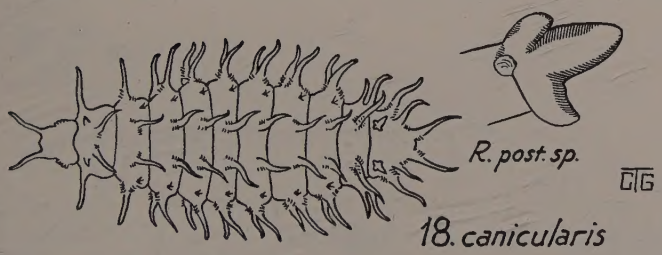
12. vigil

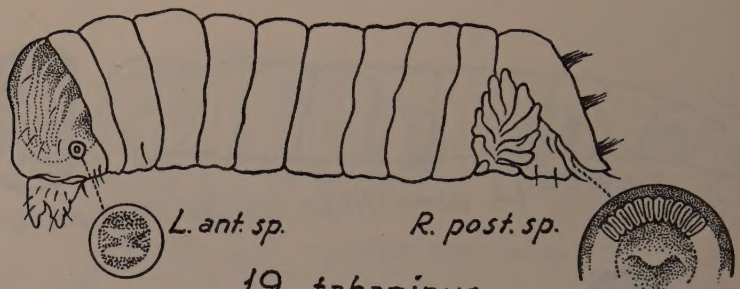
13. dampfi

14. domestica
R. post. sp.

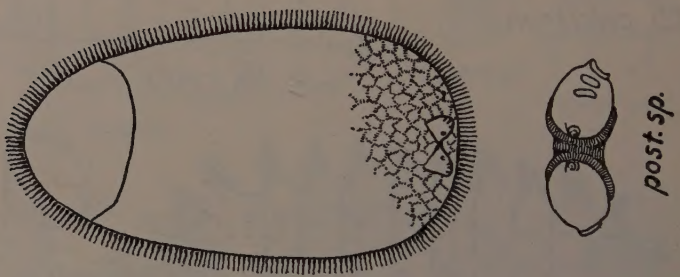

R. post. sp.
15. calcitrans
L. ant. sp.
R. post. sp.
16. rudis

R. post. sp.
17. scalaris

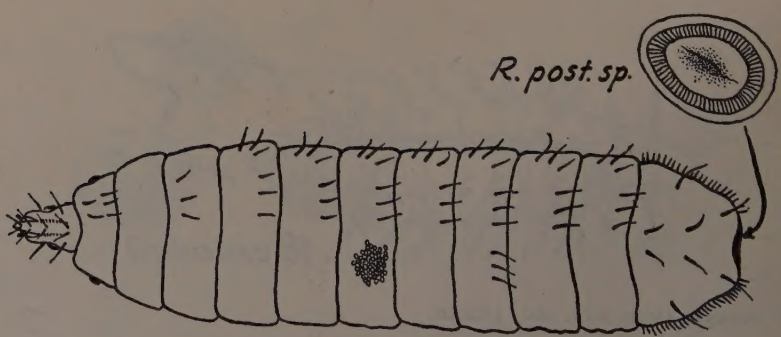

R. post. sp.
18. canicularis



19. tabaninus



20. pseudococcivora



21. illucens

GG